MACHINE IMPROVEMENT

BACKGROUND OF THE INVENTION

This invention relates in general to machine assemblies comprised of multiple interacting parts to form a useable and durable machine assembly and in particular to crop harvesting machines known as combines.

Modern combines are complex and costly machines which are capable of harvesting a wide variety of crops. By attaching different heads at the front of the combine , it can harvest corn, grains, beans and many other similar crops. During harvest season the combines are heavily used, often operating day and night . This continuous operation over rough fields causes wear on parts thus reducing the required clearance between parts which was built into the design of the machine. In addition, when the combine is fully loaded with the crop, the weight of the crop can cause distortion of some structural parts and again will reduce the clearance between adjacent parts. If the clearance is reduced to zero, the adjacent parts come into contact with each other and such contact can cause severe damage to the machine and delay harvesting of crops beyond their optimum ripeness. Damage is especially bad when the contact is between a moving part and a stationary part. For example, the shoe of most combines oscillates in a fore and aft direction in order to shake the material on the sieves mounted in the shoe and separate the crop from the chaff.. In this condition, the hammering of interfering parts due

to this oscillation not only damages the interfering parts but also damages internal parts of the machine which are fastened to the moving part..

Thus it can be seen that maintaining clearance between operating parts is essential to the profitable operation of a modern combine. It is necessary to have at hand a system for maintaining this clearance as the machine ages or when factory built-in clearances are inadequate initially or change due to wear and tear common in machines used in this environment. In addition, when the clearances between parts is inadequate or adversely changed during operation of the machine, the air flow through the machine is affected. Modern combines require a specified flow of air through the machine in order to properly separate the crop from the vines or stalks to which they are attached when the are harvested. If the gaps between adjacent parts becomes too wide, large amounts of air are lost through the gap and chaff and even crop particles are exhausted through the gaps . This can cause a buildup of chaff on working parts of the combine as well as the loss of crops because tailings which are exhausted through the gap cannot be recycled through the sieve system resulting in further crop loss. Thus it becomes evident that proper clearance between adjacent parts of a combine must be maintained while at the same time the air flow through the machine be kept at recommended volumes

SUMMARY OF THE INVENTION

In accordance with the invention claimed in this application, an apparatus is disclosed which allows the operator to reestablish proper clearances between parts of the machine which will eliminate the damage caused by parts which have moved from their

nominal relative positions to one of interference with each other. In addition, there is also disclosed apparatus for addressing the air loss through the machine after the clearances are widened to prevent damaging interference. The invention may be installed using only ordinary tools and may be done at any cite having a hard surface for jacking the machine up thus eliminating the lost time and expense of transporting the combine to a repair facility . Proper clearances are established between adjacent parts by inserting spacers between the mounting surfaces of the adjacent parts. The number of spacers installed will depend on the movement required to attain proper clearance. The spacers are of simple design and made from readily available stock and are installed using the existing attachment brackets and holes.

To insure proper airflow through the machine a flexible flap is installed and is positioned in the gap widened by the insertion of the spacers between interfering parts. Again, the flap is made of readily available material. The installation kit is fabricated from common stock and can be installed using common mechanic's tools.

It is an object of this invention to provide a means for adjusting the clearance between adjacent machine parts .

A further object is to allow installation of the adjusting means using common mechanic's tools.

A further object is to provide an adjustment means using readily available stock.

A further object of this invention is to provide a means for controlling airflow between adjacent parts after clearance adjustment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partial elevation of a machine according to the prior art.

Figure 2a is an exploded view of the installation of the spacers of the invention.

Figure 2b is a detail of the spacer of the invention.

Figure 3 is a partial elevation of the combine with parts of the invention installed.

Figure 4a is an enlarged view of the circled portion of Figure 3 showing another part of the invention installed.

Figure 4b is an elevation view of the combine with a portion of the outer cover removed to show the wrap around feature of the flap.

Figures 5a and 5b are details of the installation shown in Figure 4.

DETAILED DESCRIPTION ON THE INVENTION

Referring now to Figure 1, there is shown a partial elevation view of the portion of the rear of the combine assembled according to the prior art. Only one side of the machine is illustrated, however it is intended that this description apply to both sides in the same manner. The housing 2 contains the shoe of the combine and is at the rear portion of the machine. The outer cover 3 has been cut away for clarity. The rear axle housing 4 is assembled to the rear of the shoe housing 2 and is attached to the frame 5 at mounting bracket 12 on the frame 5 and bracket 10 on the axle housing. These brackets are typically made of angle iron and have matching holes. The two brackets are secured

together by a series of bolts 14 and nuts 16. The axle housing terminates in a box structure 6 which carries the rear axle (not shown.) and the rear wheels 8 attached to the rear axle. Typically, the rear axle is the steering axle of the combine to improve maneuverability, The space 18 between the shoe housing and the axle housing is small or, in some cases nonexistent and with wear on certain parts or attaching means as well as distortion of the housings under a full crop load, this space can be substantially reduced and may even become zero resulting in interference between the oscillating shoe housing 2 and the axle housing 4 . When interference occurs, the destructive impact forces can damage internal working parts of the combines crop cleaning system.

Referring now to Figure 2a there is shown the spacers of the invention in an exploded view to illustrate the installation. The axle housing 4 is removed from the attachment bracket 12 of the frame 5. A plurality of spacer bars, 20 are inserted between the frame bracket 12 and the axle housing bracket 10. The number of spacers required will depend on the desired space specified between the housings shown at 18 in Figure 1. Typically, three spacers of ¼ inch thickness are used The original bolts 14 are replaced with longer bolts of the same diameter to accommodate the additional thickness of the spacers Figure 2b shows a detail drawing of the spacer 20. Typically it is made of 1/4 inch steel plate and drilled or punched with holes 22 in a pattern matching the hole pattern of the brackets 10 and 12. In a typical installation the spacer will be about one and one half inches wide and 21 inches long.

In Figure 3 there is shown the completed assembly of the spacers in place between the brackets 10 and 12. It is to be understood that the installation shown in Figure 3 is repeated on the other side of the combine in the same manner. In this Figure3 there is also shown the second part of the invention the flap member 24 and its attaching piece 26. The assembly of this flap within circle A of Figure 3 is shown in an enlarged detail in Figure 4.

In Figure 4a, there is shown the flexible flap 24 which extends into the gap 18 to control air loss between the shoe housing 2 and the axle housing 4. This flap is typically rubber or similar flexible material approximately 1/8 inch thick which can withstand the rough environment in this location during combine operation. Figure 4b illustrates the flap end extended past the width of the shoe housing and wrapped around the side of the shoe housing to further control the air loss from the shoe. This flap 24 is shown in detail in Figure 5b. The flap is attached to the underside of the shoe housing 2 by means of the attaching piece 26 shown in detail in Figure 5a . As shown in Figures 5a and 5b, the attaching piece 26 is provided with a series of holes 32 which match the holes 34 provided in the flap. As shown in Figure 4, the flap is placed against a stiffener piece 7 on the lower surface of the shoe housing 2 and runs substantially along the width of the housing 2 and extend around the side of the shoe housing a short distance.. The flap 24 is attached to the shoe housing 2 by means of attaching piece 26 and self tapping screws 30 inserted in the holes 32 of the attaching piece 26 and the holes of the flap 34. The attaching piece 26 is typically made of 1/8 inch steel and would be approximately 1 inch wide and 60 inches long. The flap 24 will be about 9 inches wide and also 66 inches long to provide a 3 inch wrap around at each end..

Thus it can be seen that with the installation of a certain number of spacers between the mounting brackets of the frame and the axle housing, a proper clearance can be established between them which will prevent damage from impact with each other. Also, the installation of the flap member which extends into the space created by the insertion of the spacers controls the air loss between the two housings and improves the efficiency of the combine.